Overview and Frequently Asked Questions

Chicago Climate Exchange™ Offsets for Carbon Capture and Storage in Agricultural Soils

Agricultural Soils Summary

- Continuous conservation tillage on U.S. and Canadian farms is a rare, best-in-class practice that moves carbon dioxide from the atmosphere to the soil.

- Continuous conservation tillage helps improve soil and water quality, reduces on-farm fuel burn and emissions, and also enhances the ability of food producers to withstand climate extremes.

- Management practices that allow soils to move carbon dioxide from the atmosphere to agricultural soils are explicitly cited as an important GHG mitigation option in the United Nations Framework Convention on Climate Change (UNFCCC), in the Kyoto Protocol to the UNFCCC, and in the most recent report of the Intergovernmental Panel on Climate Change.

- Activities that increase on-farm soil carbon are explicitly included as credited activities in U.S. proposals to legislate a GHG cap-and-trade program, for both early action and inclusion going forward. Agricultural soil carbon crediting is also included in existing Canadian GHG reduction initiatives.

- All CCX projects are subject to independent third-party onsite verification. Enrolled farmers have met their contractual commitments.

- CCX rules require farmers to sign contracts committing them to five years of continuous conservation tillage on the enrolled plots. To address the possibility of reversal of carbon storage, CCX requires 20% of all earned Offsets to be placed into an insurance-like reserve. That mechanism provides a tool to facilitate an immediate accounting that would be needed to remediate any carbon loss. To date, reversals have not been material.

Offsets Summary

- Inclusion of Offset projects in the CCX™ market helps foster a broad array of win-win and cost-effective climate solutions.

- In 2007 the Intergovernmental Panel on Climate Change ("IPCC") identified approximately three dozen currently viable GHG mitigation actions. A majority of these actions are appropriately implemented via a project-based Offsets approach.

- Every CCX offset project advances a mitigation action identified by the IPCC as currently viable.

- The following principles used to define eligible projects and determine the quantity of tradable Offsets issued:
    - To qualify, a projects must be beyond regulation, recently implemented, or as applicable, best-in-class
    - Conservative crediting
    - Independent verification by expert entities
    - Reserve pools for sequestration performance assurance
    - All Carbon Financial Instrument® contracts(i.e. CCX Allowances and CCX Offsets) are equivalent when surrendered for compliance

- The CCX principle of using standardized rules for defining eligible projects and quantifying project crediting is becoming widely adopted in programs across North America.

- To assure quality and legitimacy of Offsets transacted in CCX, CCX rules require an independent verification report on project eligibility and effectiveness before the exchange will issue Offsets to the Member's CCX Registry account.

- To ensure that Offset Projects enrolled in CCX have not "double sold" credits by selling in both CCX and elsewhere CCX uses a unique serial number system in the CCX Registry and requires appropriate contractual provisions for project enrolled in CCX.

- CCX rules are designed to assure overall environmental progress and prevent "cherry picking". Any entity that seeks to register CCX Offsets that also has significant GHG emissions at its own facilities can be eligible to earn Offsets only if makes the CCX legally binding commitment to manage its facility emissions under the CCX Emission Reduction Schedule.

CCX Overview

Chicago Climate Exchange ("CCX") is an international rules-based greenhouse gas emission reduction, audit, registry and trading program based in the U.S. Launched as a pilot program in 2003, the market now includes over 350 entities. CCX participants in the industrial,

governmental and academic sectors execute legally binding commitments to meet annual emission reduction goals of 4% below baseline for 2006 and 6% below baseline by 2010.[1] CCX rules require that all emission baselines, annual reduction commitments and Offset projects are annually subjected to independent audit by authorized experts.

As of this writing, the total included baseline emissions of Chicago Climate Exchange members is in excess of 500 million metric tons CO_2. No country in the world has as much industrial emissions under a legally binding GHG emission reduction commitment.

Every active or proposed GHG cap-and-trade program worldwide includes a role for project-based emission reduction credits - "Offsets". Offsets are tradable credits produced by implementing mitigation projects in sectors not covered by the emissions cap. Every GHG mitigation project enrolled in CCX must meet eligibility standards and undergo independent verification before it can be issued tradeable Offsets in the CCX Registry.

Achieving the goals of Chicago Climate Exchange on a scale with global significance meant it was necessary to move beyond debate and set credible and practical standards for project-based crediting. Offset projects enrolled in CCX produce multiple social, economic and ecological co-benefits. The participation of Offset providers in CCX broadens market participation, and the carbon price produced by the CCX market rewards innovation and efficiency, and encourages investment and risk taking that stimulates development of superior environmental technologies.

It is noteworthy that as various proposals to activate carbon markets emerge around North America, the CCX principle of applying standardized, predictable rules for defining Offsets, and, as well, the specific CCX definitions of eligible projects, are becoming widely accepted practice.

U.S. legislative proposals for limiting greenhouse gases call for major reductions in net emissions in the coming decades. The stringency of the proposed rules warrant the deployment of every possible mitigation option to achieve the legislated targets and to effect the needed scale of global emissions mitigation. Most of the currently viable GHG mitigation options identified by the Intergovernmental Panel on Climate Change can be fully implemented only if a robust and diverse program for engaging project-based mitigation is developed. CCX rules serve to proactively engage many of these diverse mitigation options, thereby advancing global environmental objectives.

The remainder of this document provides a description of the rules, rationale and experience with Offsets in CCX. Details on CCX rules for specific GHG mitigation projects are found elsewhere on this website.

[1] CCX core rules are found at: http://www.chicagoclimateexchange.com/about/pdf/ChicagoAccord_050623.pdf

Frequently asked questions about CCX Offsets for Carbon Capture and Storage in Agricultural Soils

Q: Do the existing scientific guidance and policy structures support use of agricultural soils management as an effective greenhouse gas mitigation strategy?

A: Yes. Management practices that allow soils to move carbon dioxide from the atmosphere (where it causes harm) to agricultural soils (where carbon improves soil health) are explicitly cited as an important GHG mitigation option in the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol to the UNFCCC, and the most recent report of the Intergovernmental Panel on Climate Change (IPCC). (see *Appendix 1* below). Soils management to capture carbon is also one of the "Stabilization Wedges" articulated by Pacala and Socolow.[2]

Proposals to establish a U.S. GHG cap-and-trade program, including the proposed Bingaman-Specter bill and the proposed Lieberman-Warner bill, contain explicit provisions to include and credit agricultural management practices that result in capture of atmospheric carbon dioxide in soils.

In Canada, the first provincial-level carbon reduction and trading program (in Alberta) explicitly includes crediting for agricultural soil carbon projects. The government of Saskatchewan targets increased soil carbon capture as one of its five core GHG mitigation strategies.[3]

Q: How does CCX establish the standards, definitions and crediting rates for agricultural Offset projects?

A: Because the CCX development phase was an open process which accepted input from all who sought participation, CCX rules reflect the input of literally hundreds of individual experts. Specific expertise that guides the rules for agricultural Offsets is assembled via a Technical Advisory Committee (see *Appendix 2* below) comprised of leading experts from the academic soils science community. That Committee incorporated input from professionals employed in farming, from U.S. government agencies and from verification firms. All recommendations developed by the Technical Advisory Committee are considered for approval by the standing CCX Offsets Committee. (Information on crediting rates can be found at: http://www.chicagoclimateexchange.com/content.jsf?id=781).

[2] Pacala, S. and Socolow, R., "Stabilization Wedges: Solving the Climate Problem for the next 50 Years with Current Technologies" Science, August 13, 2004 http://www.princeton.edu/~cmi/resources/stabwedge.htm

[3] http://www.saskatchewan.ca/Default.aspx?DN=b92e42b6-6ab2-448a-a8d7-f698cad62eec

Q: What is the relative scale of agricultural Offsets compared to overall environmental progress being realized by CCX members?

A: To date the quantity of project-based Offsets enrolled in CCX has been modest compared to overall scale of emission reductions realized by CCX Members. During CCX Phase 1 (2003 through 2006) internal emission reductions realized at the industrial sites included in CCX commitments accounted for approximately 90% of total verified emission reductions. Total Offsets enrolled have accounted for approximately 10% of total verified emission reductions, with all agricultural Offsets (including soils management, on-farm reforestation, agricultural methane capture) representing around half of all Offsets.

Q: Does provision of global environmental services by agriculture through GHG mitigation hold significant potential for economic opportunity and rural development?

A: Yes. While agriculture likely will continue to be a modest part of the total share of the total GHG mitigation portfolio, the economic potential is significant. Estimates suggest that contribution of a full suite of agricultural GHG mitigation options raise net farm income by 10% or more, while helping reduce income variability and enhancing the ability to adapt to climate change.

Q: What is the carbon sequestration baseline for these projects?

A: The baseline implicit under these rules is that carbon stocks on included soils would be neither rising nor falling, but stable, if the predominant North American practices of conventional tillage or non-continuous conservation tillage was being used.

Q: What is the project "boundary" for these projects?

A: The project boundary is confined to the cropped fields that are subject to continuous conservation tillage. Offset issuance for these projects is based entirely on the soil carbon absorption rate. Conservation tillage farming practices very likely emit less – possibly far less - fuel-related carbon dioxide emissions due to reduced tractor usage. Ongoing research suggests that conservation tillage also reduces the potential for conversion of nitrogen-based nutrients to nitrous oxide emissions.

Q: Do the rules for calculating offsets by region assume that each enrolled acre realizes that quantity of carbon dioxide capture each year?

A: No. The standard rates are based on the average accumulation rates expected for large pools of farmland over multiple years based on the best available scientific information.

The issuance rates are viewed as a discounted average that could be expected to occur for the entire pool of enrolled acreage over the five-year contract period.

Q: Is no-tilled farmland likely to stay no-till after the CCX contract period? What would happen to accumulated soil carbon if the farmland is tilled subsequent to the end of the contract?

A: Research evidence strongly suggests that farmers who successfully navigate the management changes involved in going from conventional to conservation tillage will stay with the new practice after a three to six year transition period. Farmers enrolled in the program have no contractual commitment subsequent to the end of their contracts. The potential for release of accumulated soil carbon back to the atmosphere depends, among other variables, on the intensity and frequency of soil disturbing tillage practices, should those occur post-contract. Intensive tillage year after year would, if adopted, result in considerable loss, while occasional and/or low-intensity practices would lead to less loss of previously accumulated soil carbon.

Q; In setting Offset rules based on "performance standards", why is continuous conservation tillage considered a best-in-class activity?

A: Because it is a very rare practice that produces carbon benefits as well as several other important ecological benefits. Somewhere between 5% and 10% of U.S. farmland is manage under *continuous* conservation tillage. While the occasional use of conservation tillage is more widespread, only continuous conservation tillage (i.e. year after year on the same planted acres) is eligible to earn Offsets under CCX rules. Only continuous conservation tillage is eligible as that practice keeps the captured atmospheric carbon in the soil.

Q: On a quantitative scale, is the amount of carbon now being captured and stored as a result of continuous conservation tillage a relatively large phenomenon?

A: No. Using the estimate that only 7.5% of suitable land is currently managed using *continuous* conservation tillage, (18.75 million acres out of a possible 250 million acres of suitable US cropland), and assuming an annual mitigation service provision of 0.5 metric tons CO_2 per acre per years, ongoing CO_2 mitigation would amount to 9.375 million metric tons of CO_2 removal per year. This amount represents approximately .13% of annual U.S. GHG emissions.

Q: Why does CCX **not** issue carbon Offsets for the fact that low/no-tillers use far less energy than the average farmer?

A: As part of CCX's philosophy of keeping Offset rules simple and conservative, it was decided to keep the focus on the soil carbon practices only. That said, the lower fuel-based emissions footprint of low and no-tillers is an acknowledged co-benefit.

Q: Do CCX and other programs discriminate against early actors?

A: No. CCX and the other existing or proposed programs that incorporate soil carbon sequestration (e.g. Alberta's carbon market, legislation proposed in the U.S. Senate via S. 317,[4] and the Pacific Northwest Direct Seed Association project) do *not* prohibit crediting for farmers who may have started the rare practice of continuous conservation tillage prior to the program start date.

There is a clear scientific consensus that U.S. and Canadian farmland can continue to remove and store carbon from atmosphere for more than thirty years after continuous low or no-till is adopted. The question of whether farmers would have otherwise done conservation tillage even without credit is more complex than some make it out to be. First consider the practical effect of allowing Offsets *only* to those who "convert". Such a rule would encourage gaming that encourages application of high-disturbance plowing of fields that have been subject to conservation tillage in the past in order to make them "normal heavy till" acres that qualify for conversion. This would result in a potentially large loss of stored carbon to the air, before that land is returned to its previously ongoing carbon removal condition. Further, there would be very negative equity, precedent and policy signaling considerations from a rule that precludes early actors from realizing credit for the mitigation services they provide. Finally, taking such earned environmental service credits from farmers would amount to nationalizing their asset – which can be expected to lead to either sabotage or severe undermaintenance of the asset by its before-seizure owner.

Q: How does CCX address the issue of permanence (i.e. long-term retention of the removed carbon in a stored status).

A: Through a 100% payback mechanism. CCX rules require farmers to sign contracts calling for five years of continuous conservation tillage on the enrolled plots. CCX requires 20% of all earned Offsets to be placed into an insurance-like reserve pool. In the case of farmer non-performance, the quantity of all historic Offsets issued to the non-performing land will be cancelled in the reserve account, leaving a smaller quantity to be returned to the aggregator once the contract period is completed.

[4] The Electric Utility Cap-and-Trade Act, sponsored by Senator Feinstein (D-CA) and Senator Carper (D-DE).

Q: What have been the main findings resulting from field compliance inspections?

A: The compliance inspections conducted by independent experts hired by CCX, have found that enrolled farmers have complied with their contractual commitments. Errors that have been detected have tended to involve imprecision in the included acres reported by the farmer (with cases of both under and overreporting), which have been detected in one to two percent of inspected sites. Enrollment contracts are adjusted in such cases, as is Offset issuance (including corrections for any historic mis-issuance).

Q: What action is CCX taking to enhance knowledge and data on soil carbon accumulation rates?

A: CCX, with support funding from the U.S. Department of Agriculture/Natural Resources Conservation Service, has contracted to have a series of soil samples and assessments conducted to benchmark the actual soil carbon accumulation rates realized at a randomly selected set of included fields. In the coming years the initial samples will be compared with post-conservation tillage samples to provide an additional contribution the already substantial scientific literature on this issue.

Q: Are there more details on the significance of the environmental co-benefits, beyond carbon capture, that conservation tillage provides?

A: Yes. There is extensive literature on the important co-benefits that make conservation tillage attractive for both its carbon mitigation services and its local ecological benefits. As reported by Towery (undated)[5] the benefits have multiple dimensions:

> *The improved soil properties associated with no-till/strip-till also brings benefits to society. Water quality in rivers, lakes and streams is improved as there is less soil erosion and sedimentation, runoff is reduced, phosphorus movement is reduced, and pesticides degrade quicker and are less likely to find their way into waterways. Reducing or eliminating runoff and the associated non-point pollutants is a major advantage for no-till/strip-till as compared to conventional tillage. Although results will vary depending on soil type, crop rotation, length of time in no-till/strip-till, and rainfall intensity, typically the following changes will apply with no-till/strip-till:*
>
> *Reduced run-off by 75 percent;*
>
> *Reduced sediment loss by 98 percent;*
>
> *Reduced nitrogen fertilizer losses in run-off by 95 percent;*
>
> *Reduced phosphorus run-off by 92 percent;*
>
> *Reduced pesticide losses by 80 percent.*
>
> *If no-till/strip-till is used by most farmers in a watershed along with needed conservation buffers, pollutants typically associated with conventional agriculture will be drastically*

[5] "Continuous No-till – How It Pays Everyone from the Farm to the City", Towery, Dan http://www.uga.edu/water/GWRC/Papers/ToweryDan%20Paper%20March288.pdf

reduced or eliminated. Water quality will improve and those involved in fishing, swimming and boating will have a better experience as they enjoy these recreational opportunities. Changes in water quality may even attract visitors by improving the water resources for boating, fishing, eco-tourism and other means to enjoy the outdoors.

Leaving crop residue on the soil's surface and planting cover crops also benefits wildlife. Both game species, such as quail, and non-game species have improved habitat which may increase wildlife numbers if other critical items are present. This can provide increased opportunities for ag and urban hunters and for non-hunting activities such as bird watching.

Evans, *et. al.* note[6]:

"*The 30 percent soil cover that is achieved by conservation tillage is significant to reducing soil erosion by 50 percent or more compared to bare soil. Soil erosion and runoff are considered by volume the greatest contaminant of surface water in most Indiana watersheds."*

"Given that most research suggests the no-till benefits to soil physical property characteristics begin to appear no earlier than the third year of continuous no-till, it appears most farmers are abandoning notill at about the time that one would expect to reap the soil physical property benefits associated with no-till. These benefits, over time, include but are not limited to improved infiltration, reduced runoff, increased earthworm activity, improved structure or tilth, and increased organic matter content. Current farm policy does not reward farmers who use no-till, or for that matter any other method of conservation tillage."

"Certainly farmers have not given conservation tillage—especially no-till— the "continuous" time necessary to reap yield and economic benefits."

"Perhaps a program to entice farmers to stay with no-till longer term could benefit both farmers and society in general."

[6] CONSERVATION TILLAGE UPDATE: *Keeping Soil Covered and Water Clean in the New Millennium* Data Update from Indiana's Clean Water Indiana Cropland Transect Surveys, *M.G. Evans, K.J. Eck, B. Gauck, J.M. Krejci, J.E. Lake, and E.A. Matzat, November, 2000 No. 1* Clean Water Indiana Education Program Purdue University, Agronomy Department http://www.agry.purdue.edu/swq/images/tillage.pdf

Appendix 1 References to Inclusion of Agricultural Soils Management as a GHG Mitigation in the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol to the UNFCCC, and the Intergovernmental Panel on Climate Change (IPCC) *(emphasis added)*

United Nations Framework Convention On Climate Change, United Nations, 1992,
(http://unfccc.int/resource/docs/convkp/conveng.pdf)

Article 3, section 3:
"The Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures, taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost. To achieve this, such policies and measures should take into account different socio-economic contexts, be comprehensive, cover all relevant sources, sinks and reservoirs of greenhouse gases and adaptation, and comprise all economic sectors. Efforts to address climate change may be carried out cooperatively by interested Parties.

Article 4
1. All Parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, shall: ….

(b) Formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, and measures to facilitate adequate adaptation to climate change;
…
(d) Promote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases not controlled by the Montreal Protocol, including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems;

2. The developed country Parties and other Parties included in Annex I commit themselves specifically as provided for in the following: (a) Each of these Parties shall adopt national policies and take corresponding measures on the mitigation of climate change, by limiting its anthropogenic emissions of greenhouse gases and protecting and enhancing its greenhouse gas sinks and reservoirs.

Kyoto Protocol To The United Nations Framework Convention On Climate Change, United Nations, 1998
(http://unfccc.int/resource/docs/convkp/kpeng.pdf)

Article 2
1. Each Party included in Annex I, in achieving its quantified emission limitation and reduction commitments under Article 3, in order to promote sustainable development, shall:

(a) Implement and/or further elaborate policies and measures in accordance with its national circumstances, such as:

…..
(ii) Protection and enhancement of sinks and reservoirs of greenhouse gases not controlled by the Montreal Protocol…..

(iii) Promotion of sustainable forms of agriculture in light of climate change considerations;

IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate*

(http://www.ipcc.ch/SPM040507.pdf)

14. Agricultural practices collectively can make a significant contribution at low cost to increasing soil carbon sinks, to GHG emission reductions, and by contributing biomass feedstocks for energy use…..

• A large proportion of the mitigation potential of agriculture (excluding bioenergy) arises from soil carbon sequestration, which has strong synergies with sustainable agriculture and generally reduces vulnerability to climate change [8.4, 8.5, 8.8].

Table SPM.3: Key mitigation technologies and practices currently commercially available

Agriculture:	Improved crop and grazing land management to increase soil carbon storage; restoration of cultivated peaty soils and degraded lands; improved rice cultivation techniques and livestock and manure management to reduce CH4 emissions; improved nitrogen fertilizer application techniques to reduce N2O emissions; dedicated energy crops to replace fossil fuel use; improved energy efficiency.

Policies measures and instruments shown to be environmentally effective

Financial incentives and regulations for improved land management, maintaining soil carbon content, efficient use of fertilizers and irrigation

Appendix 2 Members of the CCX Soil Carbon Technical Advisory Committee

Dr. Alan Franzluebber	Ecologist, Agricultural Research Service, USDA
Dr. Charles Rice	Professor, Department of Agronomy, Kansas State University
Dr. Keith Paustian	Professor of Soil Ecology, Department of Soil and Crop Sciences Colorado State University
Dr.Rattan Lal	Senior Research Scientist Natural Resources Ecology Laboratory Colorado State University Professor, School of Natural Resources, Food, Agricultural and Environmental Science Ohio State University Director, Carbon Management and Sequestration Center and Ohio Research and Development Center Ohio State University
Dr. Mark Liebig	Soil Scientist, Agricultural Research Service, USDA
Dr. Lee Burras	Associate Professor and Pioneer Hi-Bred Professor of Agronomy Iowa State University
Dr. Sjoerd Willem Duiker	Assistant Professor, Department of Soil and Crop Sciences Pennsylvania State University
Dr. Mark Alley	W.G. Wysor Professor, Department of Crop and Soil Environmental Sciences Virginia Polytechnic Institute and State University
Dr. John Grove	Associate Professor, College of Agriculture University of Kentucky

